



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/565,765 | 01/24/2006 | Rudolf Gheczy | 03872-0033US1 | 5520 |

23973 7590 02/27/2009
DRINKER BIDDLE & REATH
ATTN: INTELLECTUAL PROPERTY GROUP
ONE LOGAN SQUARE
18TH AND CHERRY STREETS
PHILADELPHIA, PA 19103-6996

| |
|----------|
| EXAMINER |
|----------|

WU, IVES J

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1797

| | |
|-----------|---------------|
| MAIL DATE | DELIVERY MODE |
|-----------|---------------|

02/27/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|-------------------------------|-------------------------------|--|
| <i>Office Action Summary</i> | Application No. 10/565,765 | Applicant(s) GHECZY ET AL. | |
| | Examiner IVES WU | Art Unit 1797 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 May 2006.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-25 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 12-25 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>1/24/2006;5/25/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

IDS

The information disclosure statement filed 05/25/2007 fails to comply with 37 CFR 1.98(a)(1), which requires the following: (1) a list of all patents, publications, applications, or other information submitted for consideration by the Office; (2) U.S. patents and U.S. patent application publications listed in a section separately from citations of other documents; (3) the application number of the application in which the information disclosure statement is being submitted on each page of the list; (4) a column that provides a blank space next to each document to be considered, for the examiner's initials; and (5) a heading that clearly indicates that the list is an information disclosure statement. The information disclosure statement has been placed in the application file, but the information referred to therein has not been considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(1). Claim 12-14, 16, 22, 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cassano (US 4526775), evidenced by Erickson (US 4132766).

As to a method for providing oxygen in a concentrated form comprising selectively absorbing oxygen from a gaseous mixture into a liquid medium and releasing the oxygen from

Art Unit: 1797

the liquid medium, wherein the liquid medium comprising at least one ionic liquid, wherein the ionic liquid has a reversible, with regards to nitrogen, a selective oxygen-uptake capacity, liquid medium maintained at a temperature above the melting point of the ionic liquid in independent claim 12, gaseous mixture being air in claim 13,

Cassano (US 4526775) discloses oxygen production by molten alkali metal salts using multiple absorption-desorption cycles (Title). A greater recovery of high pressure oxygen is achieved at reduced power requirements and capital costs (Abstract, line 6-8). It is directed to a process for the continuous chemical separation of air into oxygen and nitrogen in which pressurized air is contacted in an absorption zone with an oxygen acceptor which becomes oxidized, the oxidized oxygen acceptor is separately decomposed by pressure reduction in a desorption zone to yield oxygen and regenerated oxygen acceptor and the regenerated oxygen acceptor is recycled to the absorption zone (Col. 2, line 30-38).. Preferably the oxygen acceptor comprises a molten solution of alkali metal nitrite and alkali metal nitrate (Col. 2, line 55-56). Preferably the oxygen acceptor constitutes a composition which is liquid and remains liquid when reacted with air at process conditions (Col. 3, line 51-53). The liquid form of alkali metal nitrite or nitrates reads on the limitations of reversible, uptake oxygen with regard to nitrogen, liquid being maintained at a temperature above the melting point of ionic liquid of instant claim 12.

As to the method for providing oxygen in a concentrated form as a reaction partner for combustion or oxidation reactions in independent claim 12, it would be obvious to use the concentrated, pressurized oxygen for reaction partner for combustion or oxidation reactions as evidenced by Erickson (US 4132766) that oxygen being widely used in large amounts in various industries, predominantly in the manufacture of steel, and has the prospect of substantially greater consumption in future coal conversion and hydrogen generation processes.

As to the an ion of the ionic liquid comprising a functional group with selective affinity for oxygen in claim 14, wherein the ion to be an anion in claim 16, it would be obvious to have a functional group with selective affinity for oxygen in order to adsorb the oxygen from air, as evidenced by Erickson (US 4132766) that oxygen is separated from air by a regenerative chemical process. Air is contacted with an oxygen acceptor comprised of a molten solution of alkali nitrite and nitrate salts at elevated temperature and pressure, causing the oxygen to react with nitrite, and thereby increasing the proportion of nitrate in the salt solution (Abstract, line 1-

6). Therefore, the nitrite ion disclosed by Cassano (US 4526775) reads on the limitations of instant claims 14 and 16.

As to the absorbed oxygen being released from the liquid medium by exposing the liquid medium microwaves in claim 22, Cassano (US 4526775) discloses the heat requirement of the endothermic decomposition reaction. It would be obvious to use microwave as well known in the art that microwave is used for heating.

As to adsorbed oxygen to be released from the liquid medium by increasing the temperature of the liquid medium in claim 24, and by decreasing the pressure of the liquid medium in claim 25, Cassano (US 4526775) discloses, particularly, high energy efficiencies to be achieved when the respective oxidation and decomposition reactions are conducted in heat exchanger relationship with one another, whereby the exothermic heat from the oxidation reaction supplies the bulk of heat requirement of endothermic decomposition reaction (Col. 3, line 44-50). Under the reduced pressure, the oxygen is released from the oxygen acceptor and exits the vessel in overhead line 28 (Col. 4, line 59-61).

(2). Claims 12, 14-15, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramprasad et al (EP 583748A1), evidenced by Erickson (US 4132766).

As to a method for providing oxygen in a concentrated form comprising selectively absorbing oxygen from a gaseous mixture into a liquid medium and releasing the oxygen from the liquid medium, wherein the liquid medium comprising at least one ionic liquid, wherein the ionic liquid has a reversible, with regards to nitrogen, a selective oxygen-uptake capacity, liquid medium maintained at a temperature above the melting point of the ionic liquid in independent claim 12, an ion of ionic liquid comprising a functional group with selective affinity for oxygen in claim 14, ion being a cation in claim 15, Ramprasad et al (EP 583748A1) disclose method for recovering oxygen from oxygen-containing gaseous mixtures (Title). It relates to cobalt complexes which are capable of reversibly binding with oxygen. The complexes are designated as either $[\text{Co}(\text{terpy})(\text{bipy})\text{X}]_n \text{Y}$ or $[\text{Co}(\text{terpy})(\text{phen})\text{X}]_n \text{Y}$, where terpy = terpyridine or substituted terpyridine, bipy = 2,2'-bipyridine or substituted bipyridine, phen = 1,10-phenanthroline or substituted phenanthroline, and X and Y represent specified coordinating anions or coordinating solvents. The subject cobalt complexes reversibly absorb molecular

Art Unit: 1797

oxygen and can be used in processes for separating oxygen from oxygen-containing gaseous mixtures (Abstract). Air separation processes using metal complexes are known in the art wherein oxygen is absorbed onto and desorbed from the resulting complex in a series of cyclic steps. In the absorption step of the cycle, a solution of the metal complex in an absorber is exposed to a flow of air or other oxygen-containing gas for a period of time at pressure above atmospheric and temperature below room temperature until a desired percentage of oxygen complex binds is ceased. In the desorption step of the cycle, the operating conditions of the absorber are changed by lowering the pressure and/or raising the temperature of the solution and passing a scrubber gas through the column to scrub at least a portion of the bound oxygen from the metal complex (page 2, line 25-33). The cation of metal complex reads on the limitations of reversible, uptake oxygen with regard to nitrogen, liquid being maintained at a temperature above the melting point of ionic liquid of instant claim 12 as well as affinity for oxygen of instant claim 14.

As to the method for providing oxygen in a concentrated form as a reaction partner for combustion or oxidation reactions in independent claim 12, it would be obvious to use the concentrated, pressurized oxygen for reaction partner for combustion or oxidation reactions as evidenced by Erickson (US 4132766) that oxygen being widely used in large amounts in various industries, predominantly in the manufacture of steel, and has the prospect of substantially greater consumption in future coal conversion and hydrogen generation processes.

As to liquid medium comprising perfluorinated residues in claim 17, Ramprasad et al (EP 583748A1) disclose the formula 7 & 8, both have halogen atom on the ring forming perfluorinated residues.

(3). Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cassano (US 4526775), further in view of Brennecke et al (US 6579343B2), evidenced by Sweeney et al (US 5856533A).

As to absorbing oxygen from gaseous mixture to be carried out by passing a finely divided stream of air into the liquid medium in claim 18, and trickle-bed in claim 19, a porous membrane in a membrane contact in claim 20, Cassano (US 4526775) discloses absorption zone.

Art Unit: 1797

Cassano does not teach trickle-bed by passing divided stream of air into liquid medium or membrane contactor as claimed.

However, Brennecke et al (US 6579343B2) teach purification of gas with liquid ionic compounds (Title). Contacting the LIC with the gaseous mixture may be accomplished in any of variety ways. Contacting can occur by permeation through a supported liquid membrane or by use of conventional liquid absorbers such as counter-current liquid absorbers and the like (Col. 6, line 6-14). The LIC may also be used in a conventional gas/liquid absorption unit-based system comprising a fixed bed (Col. 6, line 45-46). It would include trickle-bed and bubble-bed as evidenced by Sweeney et al that fixed beds, either trickle-bed or bubble-bed (Col. 2, line 45-47). as well known in the art that trickle-bed would have a finely divided stream of gas phase into the liquid medium as claimed.

The advantages of fixed bed are to promote intimate mixing of the liquid ionic compound with the source gas and to be conducted for a time sufficient to allow significant removal of targeted components. Thus maximizing surface area contact are desirable (Col. 6, line 6-12). Such system can be operated in batch mode or continuous mode (Col. 6, line 46-48).

Therefore, it would have been obvious at time of the invention to install the trickle-bed absorber or liquid membrane disclosed by Brennecke et al (US 6579343B2) for the absorption zone of Cassano in order to achieve the advantages cited above.

(4). Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cassano (US 4526775), in view of Ramprasad et al (EP 583748A1) further in view of Voorhees (US 2196281).

As to absorbing oxygen from gaseous mixture to be carried out by contacting the gaseous mixture and the liquid medium with a porous membrane in a membrane contactor in claim 20, Cassano (US 4526775) discloses the desorption zones (Col. 4, line 18-40). Cassano does not teach the use of stripping gas such as exhaust gas as claimed.

However, Ramprasad et al (EP 583748A1) teach method for recovering oxygen from oxygen-containing gaseous mixture (Title). In desorption step of cycle, the operating conditions of the absorber are changed by lowering the pressure and/or raising the temperature of the

solution and passing a scrubber gas through the column to scrub at least a portion of the bound oxygen from the metal complex (page 2, line 30-33).

The advantage of using stripping gas for desorption is to improve the performance separation as well known in the art. Both Ramprasad et al, Cassano do not teach the use of exhaust gas as stripping gas. However, it would include the exhaust gas for stripping as evidenced by Voorhees (US 2196281) that stripping gas, for example flue gas, air or steam may be supplied by line 20 at the base of the regenerator and heat may be supplied to the solution in the base of the regenerator by closed steam heating coil 21 (page 1, col. 2, line 19-23).

Therefore, it would have been obvious at time of the invention to install stripper disclosed by Ramprasad et al by using flue gas disclosed by Voorhees for the desorption stage of Cassano in order to achieve the cited advantages.

(5). Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cassano (US 4526775), in view of Ramprasad et al (EP 583748A1) further in view of Horn et al (US 6682794B1).

As to absorbed oxygen to be released from liquid medium by catalytically degassing the liquid medium in claim 23, Cassano (US 4526775) discloses the desorption zones (Col. 4, line 18-40). Cassano does not teach the use of stripping gas such as exhaust gas as claimed.

However, Ramprasad et al (EP 583748A1) teach method for recovering oxygen from oxygen-containing gaseous mixture (Title). In desorption step of cycle, the operating conditions of the absorber are changed by lowering the pressure and/or raising the temperature of the solution and passing a scrubber gas through the column to scrub at least a portion of the bound oxygen from the metal complex (page 2, line 30-33). The advantage of using stripping gas for desorption is to improve the performance separation as well known in the art. Both Ramprasad et al, Cassano do not teach catalytically degassing liquid medium as claimed

However, Horn et al (US 6682794) teach polycarbonate containers (Title). it is prepared by the phase interface process that is characterized in that the aqueous solution of an alkali salt of a bisphenol used, contains dissolved oxygen in an amount less than 150 ppb. (Abstract). Oxygen is removed from the fully deionized water in a manner known in principle, e.g, catalytically, by degassing or by inert gas stripping (Col. 3, line 12-14).

Art Unit: 1797

In view of the functionally identical desorption methods, catalytically degassing and inert gas stripping, it would have been obvious at time of the invention to substitute the catalytically degassing method disclosed by Horn et al with scrubbing method (stripping method) disclosed by Ramprasad et al for the desorption zone of Cassano based on their interchangeability as recognized functional equivalence as desorption method.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

Art Unit: 1797

Date: February 24, 2009

/DUANE SMITH/

Supervisory Patent Examiner, Art Unit 1797